

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-052646

(43)Date of publication of application : 22.02.2000

(51)Int.Cl.

B41M 5/00  
B41J 2/01

(21)Application number : 11-158375

(71)Applicant : FUJI PHOTO FILM CO LTD

(22)Date of filing : 04.06.1999

(72)Inventor : NAKAMURA YOSHISADA  
SHIBAHARA YOSHIHIKO

(30)Priority

Priority number : 10157747 Priority date : 05.06.1998 Priority country : JP

## (54) IMAGE RECORDING MEDIUM AND IMAGE RECORDING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image recording medium, which is preferably employed to a latest improved ink jet printed and with which an excellent picture quality and a strong film quality are obtained, and an image recording method using the medium.

SOLUTION: In the image recording medium to be provided, its ink fixing layer on a support includes a modified polyvinyl alcohol, which has a small amount of an acetoacetyl group-containing structural unit and the degree of saponification of which is 85-100, and an unmodified polyvinyl alcohol having the degree of saponification 60-85 or a modified polyvinyl alcohol, which has a small amount of an acetoacetyl group-containing structural unit and the degree of saponification of which is 60-85. In addition, an image recording method employing the above-mentioned medium is also provided.

## LEGAL STATUS

[Date of request for examination] 10.08.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

## \* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\* shows the word which can not be translated.

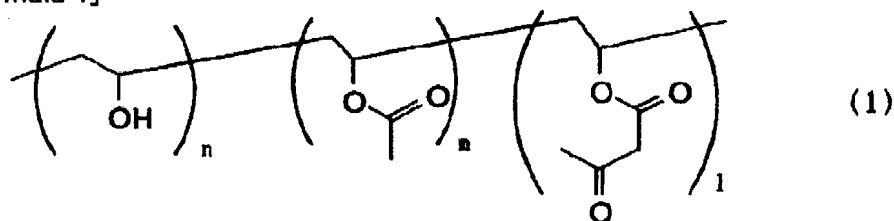
3.In the drawings, any words are not translated.

## CLAIMS

[Claim(s)]

[Claim 1] the ink fixed bed on a base material -- (\*\*) -- the denaturation poly vinyl alcohol expressed with a general formula (1), and the image recording medium by which a (b) saponification degree is characterized by the native poly vinyl alcohol of 60 to 85 containing.

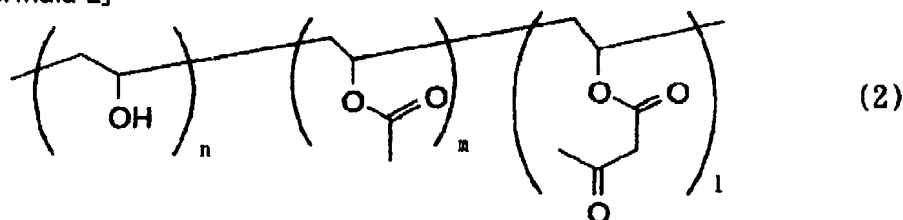
[Formula 1]



$$l = 0.1 \sim 20 \text{モル}\%, \quad m+n = 80 \sim 99.9 \text{モル}\%, \quad 0.85 < n/(m+n) < 1$$

[Claim 2] The image recording medium characterized by the denaturation poly vinyl alcohol expressed with the ink fixed bed on a base material by the general formula (Ha) (2) containing.

[Formula 2]



$$l = 0.1 \sim 20 \text{モル}\%, \quad m+n = 80 \sim 99.9 \text{モル}\%, \quad 0.6 \leq n/(m+n) \leq 0.85$$

[Claim 3] The image recording medium according to claim 1 or 2 characterized by the denaturation poly vinyl alcohol which the ink fixed bed more than two-layer is formed on a base material, and is expressed only with the ink fixed bed nearest to a base material by the general formula (1) or the general formula (2) containing.

[Claim 4] The image recording medium according to claim 1 to 3 characterized by being the paper which the base material laminated with polyolefine.

[Claim 5] The image recording approach characterized by adhering and fixing water color ink in the image, and recording an image on an image recording medium according to claim 1 to 4.

[Translation done.]

**\* NOTICES \***

JPO and NCIPJ are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

---

**DETAILED DESCRIPTION**

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to an image recording medium, especially the image recording medium used suitable for the ink jet method which improved image quality and membraneous quality.

[0002]

[Description of the Prior Art] By the image recording medium used for an ink jet method, the paper called ordinary paper and an ink jet record form was used. As for the common ink jet record form, the ink absorbing layer is prepared on paper (base material). However, by the conventional image recording medium, it is the situation that the engine performance of a printer cannot fully be demonstrated, by remarkable amelioration of the printer of the latest ink jet method. There is a blot of ink in the conventional image recording medium, and it cannot respond to the high resolution of the printer of the latest ink jet method.

[0003] Moreover, although an image came to be asked for glossiness like a photograph with the improvement of image quality, the conventional image recording medium has low glossiness. Therefore, amelioration is needed for extent corresponding to amelioration of an ink jet method also for the image recording medium.

[0004] Amelioration of an image recording medium is indicated by each official report of JP,57-89954,A, 60-224578, 61-12388, JP,4-216990,A, 6-64306, 7-179032, and 8-24436 etc. The record ingredient (liquid absorptivity sheet) with which the liquid absorptivity lower layer and the liquid permeability surface layer are prepared one by one on the base material is indicated by above-mentioned JP,57-89954,A. The transparent hydrophilic coat \*\*\*\*\* record ingredient (film for over head projectors) which consists of water soluble polymer matter on a base material (transparent base material film which consists of synthetic resin) is indicated by above-mentioned JP,60-224578,A. The record ingredient which has an ink maintenance layer and an ink transparency layer is indicated by above-mentioned JP,61-12388,A. The record ingredient with which the ink absorption layer containing a polyolefine layer and gelatin, and starch is prepared one by one on the base material is indicated by above-mentioned JP,4-216990,A. The record ingredient with which the ink absorbing layer containing a polyolefine layer and gelatin is prepared one by one on the base material is indicated by above-mentioned JP,6-64306,A. The record ingredient with which the ink absorbing layer containing a polyolefine layer and synthetic hydrophilic-property resin is prepared one by one on the base material is indicated by above-mentioned JP,7-179032,A. The record ingredient with which the ink absorbing layer containing gelatin and a basic latex is prepared on the base material is indicated by above-mentioned JP,8-24436,A.

[0005] The method of preparing a polyolefine layer especially on a base material among the amelioration approaches of these image recording media is excellent in the point that an image with the gloss near [ form / conventional / ink jet record ] a photograph is obtained. However, since many high polymers of many \*\* ink nature were used for an ink absorbing layer in order to acquire the resolution and the graininess of an image, and membranous reinforcement fell, the coexistence with image quality and membraneous quality was not enough.

[0006]

[Problem(s) to be Solved by the Invention] The purpose of this invention is applied to the printer of the ink jet method with which recently was improved, and is to offer the image recording medium used suitably. Other purposes of this invention are to offer the image recording medium by which high image quality and strong membraneous quality are obtained. this invention -- being the further -- others -- the purpose is to offer the image recording approach which used the above-mentioned image recording medium.

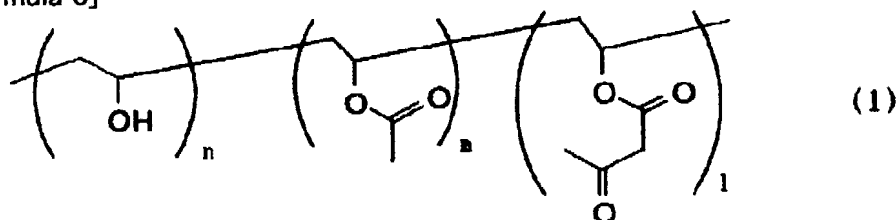
[0007]

[Means for Solving the Problem] According to this invention, the image recording medium of following the (1) - (3) and the image recording approach of (4) are offered, and the above-mentioned purpose is attained.

(1) the ink fixed bed on a base material -- (\*\*) -- the denaturation poly vinyl alcohol expressed with a general formula (1), and the image recording medium by which a (b) saponification degree is characterized by the native poly vinyl alcohol of 60 to 85 containing.

[0008]

[Formula 3]

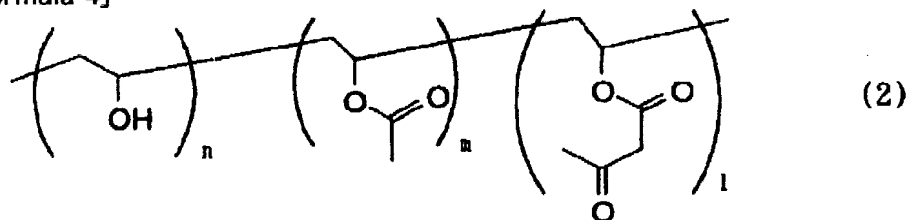


$$l = 0.1 \sim 20 \text{モル\%}, m+n = 80 \sim 99.9 \text{モル\%}, 0.85 < n/(m+n) < 1$$

[0009] (2) The image recording medium characterized by the denaturation poly vinyl alcohol expressed with the ink fixed bed on a base material by the general formula (Ha) (2) containing.

[0010]

[Formula 4]



$$l = 0.1 \sim 20 \text{モル\%}, m+n = 80 \sim 99.9 \text{モル\%}, 0.6 \leq n/(m+n) \leq 0.85$$

[0011] (3) The above (1) characterized by the denaturation poly vinyl alcohol which the ink fixed bed more than two-layer is formed on a base material, and is expressed only with the ink fixed bed nearest to a base material by the general formula (1) or the general formula (2) containing, or an image recording medium given in (2).

(4) An image recording medium given in either of above-mentioned (1) - (3) characterized by being the paper which the base material laminated with polyolefine.

(5) The above (1) The image recording approach characterized by adhering and fixing water color ink in the image, and recording an image on an image recording medium given in either of - (4).

[0012]

[Embodiment of the Invention] The denaturation PVA expressed with the denaturation PVA expressed with a [denaturation polyvinyl alcohol [ which is used for an image recording medium ] (denaturation PVA)] general formula (1) and a general formula (2) is contained in the ink fixed bed of the image recording medium of this invention. Hereafter, the denaturation PVA expressed with Denaturation PVA (1) and a general formula (2) in the denaturation PVA expressed with a general formula (1) is called denaturation PVA (2), respectively.

[0013] In one mode (henceforth "a mode (1)") of this invention, Denaturation PVA (1) and Native PVA contain in the ink fixed bed. the saponification degree of this native PVA — 60–85 — it is 65–80 preferably. In another mode (henceforth "a mode (2)") of this invention, Denaturation PVA (2) contains in the ink fixed bed.

[0014] the above-mentioned general formula (1) showing Denaturation PVA (1) — setting — I — 0.1 – 20-mol % — it is 1 – ten-mol % preferably, and 80 – 99.9-mol%, 90 – 99-mol the percentage that is % and n occupies among the sum totals of m and n, i.e.,  $n/(m+n)$  exceeds 0.85, and the sum total rates of m and n are 0.85–0.9 preferably less than one. Therefore, the saponification degree of Denaturation PVA (1) exceeds 85, and are 85–90 preferably less than one. the above-mentioned general formula (2) showing Denaturation PVA (2) — setting — I — 0.1 – 20-mol % — desirable — 1 – ten-mol % — it is — the sum total rate of m and n — 80 – 99.9-mol % — it is 90 – 99-mol % preferably. the rate  $(m+n)$ , i.e.,  $n/$ , that n occupies among the sum totals of m and n — 0.6 to 0.85 — it is 0.7–0.83 preferably. therefore, the saponification degree of Denaturation PVA (2) — 60–85 — it is 70–83 preferably.

[0015] Although it is easily compoundable, Denaturation PVA (1) and (2) are marketed and they can be used. As a commercial item of Denaturation PVA (1), go SEFIMA Z100 and Z200 (n:90-mol % and m:4-mol % and l:6-mol %) by the Nippon Synthetic Chemical Industry Co., Ltd. and Z210 grade are mentioned, for example. Denaturation PVA (1) and Denaturation PVA (2) are one-sort independent in a mode (1) and a mode (2), respectively — it is — it can use combining two or more sorts.

[0016] Denaturation PVA (1) is used together with Native PVA in the above-mentioned mode (1) — having — the amount used — desirable — 0.01 – 2 g/m<sup>2</sup> — it is 0.1 – 0.5 g/m<sup>2</sup> more preferably. the amount of the native PVA used — desirable — 1 – 20 g/m<sup>2</sup> — it is 5 – 10 g/m<sup>2</sup> more preferably. In this mode (1), when a saponification degree combines this and the native PVA with a low saponification degree as denaturation PVA using a high (there are many hydroxyl groups) thing, ink absorptivity is high, and can obtain the ink fixed bed excellent in membraneous quality nature, and brings about a good result. Native PVA is one-sort independent — it is — it can use combining two or more sorts.

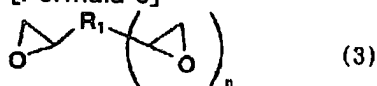
[0017] Moreover, in the above-mentioned mode (2), Denaturation PVA (2) contains in the ink fixed bed. the amount of the denaturation PVA used — desirable — 1 – 20 g/m<sup>2</sup> — it is 2 – 10 g/m<sup>2</sup> more preferably. In this mode (2), since saponification degrees 60–85 and the denaturation PVA which saponified moderately are used, Native PVA is not used together, but \*\* can also maintain ink absorptivity and brings about a good result. Of course, little content of the native PVA may be carried out by request in the range which does not spoil the above-mentioned advantage.

[0018] In addition, since the structural unit containing the aceto acetyl group by which copolymerization is carried out to Denaturation PVA (1) and (2) has an activity methylene group, it can make association for other radicals by nucleophilic substitution.

[0019] It is desirable to use together the compound which has two or more radicals which can construct a bridge in these [ PVA ] in intramolecular to the ink fixed bed by reacting from a viewpoint of the reinforcement of membraneous quality with reaction radicals, such as a hydroxyl group which the above-mentioned denaturation PVA and Native PVA have, a carbonyl group, and the aceto acetyl group. The compound which corresponds to the hardening agent which carries out the following as such a compound is mentioned. As a radical in which this reaction is possible, the amino group, a carbonyl hydrazine radical, an isocyanate radical, a methoxy methylamino radical, an aldehyde group (formalin is included), a metal salt, and an epoxy group are mentioned. Especially, an isocyanate radical and an epoxy group are desirable. It is desirable to use together the compound expressed with the following general formula (3) which contains especially two or more epoxy groups in intramolecular as a hardening agent.

[0020]

[Formula 5]



$$n = 1 \sim 2$$

[0021] R1 is a divalent radical among a formula. Preferably, it is the radical which combined an alkyl

group or a ether group, and these. As an example of the desirable above-mentioned hardening agent used for this invention, the following compound H-1 and H-2 can be mentioned. However, this invention is not restricted to these.

[0022]

[Formula 6]

H-1



H-2



[0023] The image recording medium of [lamination of image recording medium] this invention consists of the ink fixed bed and a surface protective layer. As for the ink fixed bed, it is desirable to prepare between a surface protective layer and a base material. As for the ink fixed bed, it is desirable to use the denaturation PVA (1) which may consist of two or more layers and is expressed with the layer nearest to a base material side in this case a general formula (1) and (2), and Denaturation PVA (2). Moreover, a surface protective layer may also be constituted by the need by two or more layers.

[0024] As for the thickness (it is total thickness when more than one exist) of the ink fixed bed prepared on a base material, it is desirable that it is 5-27 micrometers, and it is still more desirable that it is 8-20 micrometers. As for the layer prepared on a base material, it is desirable that the rate of swelling in ink is 100 - 300% as a whole, and it is still more desirable that it is 150 - 250%. The rate of swelling is the value (%) which broke by desiccation thickness the value (swelling value) which lengthened desiccation thickness from the thickness of the spreading layer measured after being immersed in the ink which sets an image recording medium as the 25-degree C object for 1 minute. Adjustment of the rate of swelling is important in order to control the penetration and breadth of ink, or in order to prevent the blemish within a printer. Although forming by coincidence spreading is desirable as for parent ink \*\*\*\* prepared on a base material, it may be formed by spreading many times. Hereafter, sequential explanation is given about each class, those components, and the image recording approach.

[0025] A [surface protective layer] surface protective layer is an ink transparency layer (protective layer) which uses the polymer of the hydrophilic property of gelatin, a saccharide, water-soluble synthetic macromolecule, etc. as a binder. As for the hydrophilic polymer, the layer is contained 50% of the weight or more. As for a hydrophilic polymer, it is desirable that it is 55% of the weight or more of a layer, and it is still more desirable that it is 60 % of the weight or more. A surface protective layer contains further the solid particulate whose mean particle diameter is 3-100 micrometers as a mat agent. As for a surface protective layer, it is desirable that a surfactant is included. A surface protective layer has the function which controls the breadth and penetration of ink. Furthermore, a surface protective layer also has the function to protect physically or chemically the coloring matter image fixed to the ink absorption layer. A surface protective layer has the thickness of 0.2-2 micrometers. As for thickness, it is desirable that it is 0.3-1 micrometer. A slipping agent, antiseptics, a latex, a tenebescence inhibitor, a tint attachment color, a pigment, a stay [ a fluorescence increase ] agent, etc. can be used for a surface protective layer if needed.

[0026] The [ink fixed-bed] ink fixed bed is ink acceptance and the image fixed bed which consist of polymers which can mainly receive ink. As for the ink acceptance polymer, the layer is usually contained 50% of the weight or more. As for an ink acceptance polymer, it is desirable that it is a PVA system polymer. a PVA system polymer -- the ink fixed bed -- 60 % of the weight or more is occupied still more preferably 55% of the weight or more preferably. As for the PVA system polymer of the ink fixed bed, it is desirable that it is the amount of macromolecules (300 or more polymerization degree) comparatively. Moreover, as for the ink fixed bed, it is desirable that a polymer mordant is included in addition to a PVA system polymer. 2-20 micrometers of 3-20 micrometers of 5-15 micrometers of

thickness of the ink fixed bed are 7-15 micrometers most preferably still more preferably more preferably. To the ink fixed bed, it is desirable to use a polymer mordant together. Moreover, antiseptics, a latex, a tenebrescence inhibitor, a tint attachment color, a pigment, a stay [ a fluorescence increase ] agent, etc. can be used if needed. The ink fixed bed is constituted by two or more layers if needed. As for Denaturation PVA (1) and (2), it is desirable to use for the layer nearest to a base material among two or more layers as an ink acceptance polymer.

[0027] An under coat can be prepared between the following polyolefine layers and the ink fixed beds which are prepared on a [under coat] base material. An under coat has the function to adjust the rate of swelling, and curl balance. An under coat is an under coat which uses gelatin as a binder preferably. gelatin -- desirable -- a layer -- 60 % of the weight or more is occupied still more preferably 55% of the weight or more more preferably 50% of the weight or more. It is desirable that a fluorescent brightener is included in an under coat in addition to gelatin. 0.5-5 micrometers of thickness of an under coat gelatin layer are 0.7-3 micrometers more preferably.

[0028] A [polyolefine layer] polyolefine layer is a layer which is prepared on a paper base material and which uses polyolefine as a binder. polyolefine -- desirable -- a layer -- 60 % of the weight or more is occupied still more preferably 55% of the weight or more more preferably 50% of the weight or more. Polyethylene, polystyrene, polybutene, etc. can be mentioned as an example of polyolefine. Moreover, polyolefine may be an olefine copolymer. Especially, especially polyethylene is desirable. A polyolefine layer is prepared by spreading or lamination on a base material. As for a polyolefine layer, it is desirable to contain white pigments, a tint attachment color, or a pigment. As white pigments, titanium oxide and a zinc oxide are desirable, and especially anatase mold titanium oxide is desirable. A zinc oxide may be used together in order to improve the dispersibility of anatase mold titanium oxide. When using together, as for the rate of a zinc oxide, it is desirable that it is 50 or less % of the weight to the whole pigment. The content of the white pigments in a polyolefine layer is 15 - 30 % of the weight still more preferably ten to 50% of the weight more preferably five to 50% of the weight.

[0029] A color or a pigment colors a polyolefine layer, and it is used in order to adjust the surface reflection factor. As for a color or a pigment, it is desirable to have thermal resistance in the spreading temperature (generally 300 degrees C or more) of a polyolefine layer. Cobalt blue, ultramarine blue, and neodymium oxide are contained in the example of a desirable color or a desirable pigment. As for a tint attachment color or a pigment, it is desirable to use it in 0.1 - 3% of the weight of the range of white pigments. The class of a tint attachment color or pigment can be chosen, and the surface reflection property of a base material can be adjusted by adjusting the amount used. 10-100 micrometers of 15-50 micrometers of polyolefine layer thickness are 20-35 micrometers still more preferably more preferably. As for the front face of a polyolefine layer, it is desirable to finish in the shape of a mirror plane. After carrying out surface activity-ized processing (an example, corona discharge treatment, flame treatment) on the front face of a polyolefine layer, each class mentioned above may be prepared in it.

[0030] As a [base material] base material, paper or plastic film is used preferably. Paper is more desirable than plastic film. In addition, in the case of plastic film, there may not be a polyolefine layer. As for the thickness of a base material, it is desirable that it is 50-300 micrometers, and it is still more desirable that it is 80-200 micrometers.

[0031] In the case of a [layer prepared in other arbitration] paper base material, it is desirable to prepare a polyolefine layer also in the background of a base material as a back layer. About the detail of a polyolefine back layer, it is the same as that of the polyolefine layer prepared in a side front. As for a back layer, it is desirable to have an antistatic function. As for the surface resistivity of a back layer, specifically, it is desirable that they are  $1 \times 10^{12}$  or less ohm-cm.

[0032] In addition to usual gelatin, a gelatin derivative is contained in "gelatin" in [gelatin] this invention. Gelatin is using the following hardening agent and it is desirable to make a bridge construct (hardening).

[0033] A [hardening agent for gelatin] hardening agent is classified into a low-molecular hardening agent and a macromolecule hardening agent. the example of a low-molecular hardening agent -- an aldehyde compound (an example and formaldehyde --) A glyoxal, a glutaraldehyde, an aziridine compound, an isoxazole compound, an epoxy compound and a vinyl sulfone compound (an example, 1

and 3, and 5-thioria chestnut roil-hexahydro-s-triazine —) Bis(vinyl sulfonyl) methyl ether, N, and N'-ethylene-bis(vinyl sulfonyl acetamido) ethane, An N and N'-trimethylene-screw (vinyl sulfonyl acetamido), an acryloyl compound, a carbodiimide compound, and a triazine compound (an example —) 2, 4-dichloro-6-hydroxy-s-triazine, and N-methylol compound (an example —) a dimethylolurea, methylol dimethylhydantoin, and a dioxane derivative (an example —) 2, 3-dihydroxy dioxane, mucohalogenic acid (an example, mucochloric acid, mucophenoxy KURORU acid), dialdehyde starch, 1-Krol-6-hydroxy thoriadinyl-ized gelatin, a maleimide compound, an acetylene compound, and methansulfonic acid ester are contained.

[0034] About an aziridine compound, each official report of each specification of the PB report No. 19921, a U.S. Pat. No. 2950197 number, said 2964404 numbers, said 2983611 numbers, and said 3271175 numbers, JP,46-40898,B, and JP,50-91315,A has a publication. About an isoxazole compound, a U.S. Pat. No. 331609 number specification has a publication. About an epoxy compound, each specification of a U.S. Pat. No. 3047394 number, West German JP,1035663,B, and British JP,1033518,B and JP,48-35495,B have a publication. a vinyl sulfone compound — the PB report No. 19920 and West German JP,1100942,B — said — No. 2337412 — said — No. 2545722 — said — No. 2635518 — said — No. 2742308 — said — No. 2749260, British JP,1251091,B, and a U.S. Pat. No. 3539644 number — said — each specification of No. 3490911 has a publication. About an acryloyl compound, a U.S. Pat. No. 3640720 number specification has a publication. About a carbodiimide compound, each specification of a U.S. Pat. No. 2938892 number, said 4043818 numbers, and said 4061499 numbers and JP,46-38715,B have a publication. About a triazine compound, each specification of West German JP,2410973,B, said 2553915 numbers, and a U.S. Pat. No. 3325287 number and JP,52-12722,A have a publication.

[0035] The polymer which has an aldehyde group like the copolymer of an acrolein for the example of a giant-molecule hardening agent (it indicates on U.S. Pat. No. 3396029 number specifications), the polymer (a U.S. Pat. No. 3362827 number specification —) which has a dichloro triazine radical It indicates to the research disclosure No. (1978) 17333. The polymer which has an epoxy group (it indicates on U.S. Pat. No. 3623878 number specifications), The polymer which has a radical used as an activity vinyl group or its precursor (the research disclosure No. (1978) 16725) The polymer (it indicates to JP,56-66841,A) which has a publication and an activity ester group is contained in each official report of a U.S. Pat. No. 4161407 number specification, JP,54-65033,A, and 56-142524. As for the amount of the hardening agent used, it is desirable that it is 0.1 – 30% of the weight of gelatin, and it is more desirable that it is 0.5 – 10 % of the weight. In addition, since a low-molecular hardening agent has diffusibility, it only adds to the coating liquid of any one-layer gelatin layer, and it can carry out the dura mater of other gelatin layers. These hardening agents are carrying out the dura mater reaction not only with gelatin but with the other polymer actually.

[0036] a [PVA system polymer] PVA system polymer — a vinyl alcohol unit — more than 50 mol % — it contains. Therefore, whenever [ saponification / of a PVA system polymer ] is more than 50 mol %. As for whenever [ saponification ] (vinyl alcohol unit comparatively), it is desirable that it is [ 60–90 mol ] %, and it is still more desirable that it is [ 65–80 mol ] %. Whenever [ saponification / of the polyvinyl alcohol used for the detail paper for ink jets ] is a value exceeding 90–mol %. It became clear that the granular nonuniformity of the ink in an image was cancelable with research of this invention person because whenever [ saponification ] uses the polyvinyl alcohol not more than 90 mol %. A PVA system polymer can include a guiding [ from an ethylene nature partial saturation monomer ]—in addition to vinyl alcohol unit repeat unit. Acrylic ester, methacrylic ester, acrylamide, methacrylamide, an olefin, vinyl ether, unsaturated fatty acid (an example, an acrylic acid, a methacrylic acid, itaconic acid), and vinyl ester (an example, propionic-acid vinyl, pivalic-acid vinyl) are contained in the example of an ethylene nature partial saturation monomer. The alkylthio group or the aryl thio radical may combine with the end of a PVA system polymer. As for the carbon atomic number of an alkylthio group and an aryl thio radical, it is desirable that it is eight or more.

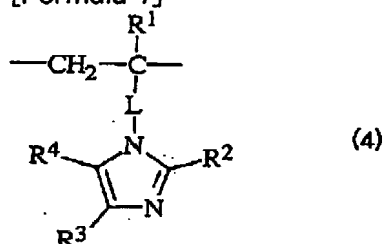
[0037] As for a PVA system polymer, it is desirable that it is especially usual polyvinyl alcohol which consists only of a vinyl alcohol unit and a vinyl acetate unit. It is desirable that it is 300 or more, as for the polymerization degree of the PVA system polymer used for the ink fixed bed, it is still more desirable that it is 500–5000, and it is most desirable that it is 500–2000.



[0038] As for the [polymer mordant] ink fixed bed, it is desirable that a polymer mordant is included. The vinyl polymer which has the vinyl polymer and the nitrogen-containing heterocycle radical which have the third class amino group as a polymer mordant is typical. The third class amino group and a nitrogen-containing heterocycle radical may be in the condition of the fourth class ammonium. The vinyl polymer which has a nitrogen-containing heterocycle radical is used preferably. As for a nitrogen-containing heterocycle radical, it is desirable that it is the third class imidazole group. The following type (4) shows the repeat unit which has the third class imidazole group.

[0039]

[Formula 7]

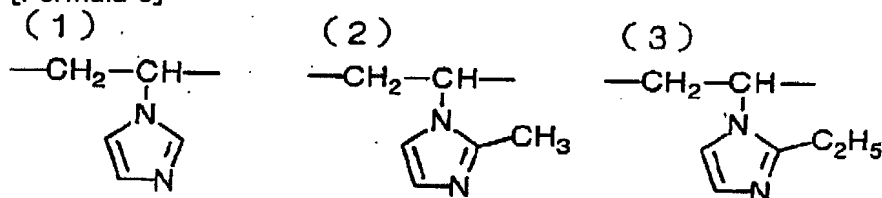


[0040] The inside of a formula, R1, R2, and R3 And R4 Independently, a hydrogen atom or a carbon atomic number is the alkyl group of 1-6, and; and L are the connection radicals of the bivalence chosen from the group which consists of single bond or an alkylene group, an arylene radical, -CO-, -O-, -NH-, and those combination, respectively. R1, R2, and R3 And R4 Respectively, independently, it is desirable that they are a hydrogen atom, methyl, or ethyl, and it is still more desirable that they are a hydrogen atom or methyl. As for the alkylene group of L, it is desirable to have the carbon atomic number of 1-6. As for the arylene radical of L, it is desirable that it is phenylene. About L, the example of the combination of an alkylene group, an arylene radical, -CO-, -O-, and -NH- is shown below. Example L1 -L5 of the following Left-hand side combines with a principal chain, and right-hand side combines with an imidazole ring, respectively.

L1 : - arylene radical-alkylene group - L2 : -CO-O-L3 : -CO-NH-L4 : -CO-O-alkylene group - L5 : The example of a repeat unit of having the third class imidazole group expressed with the above-mentioned formula (4) to below -CO-NH-alkylene group - is shown.

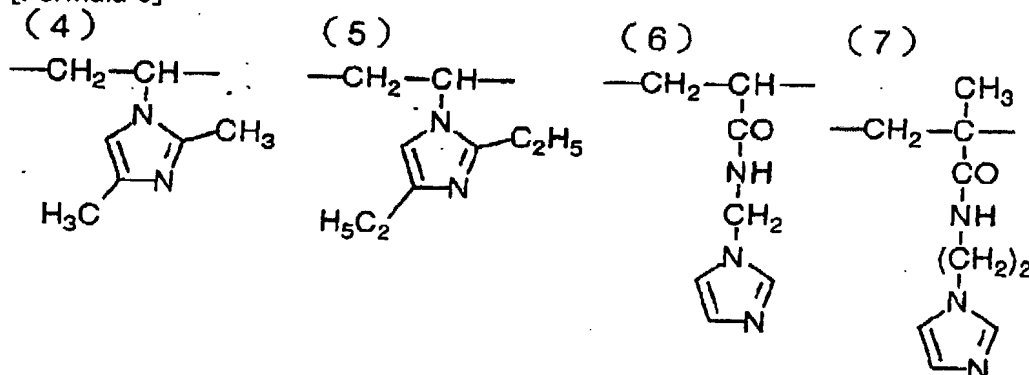
[0041]

[Formula 8]



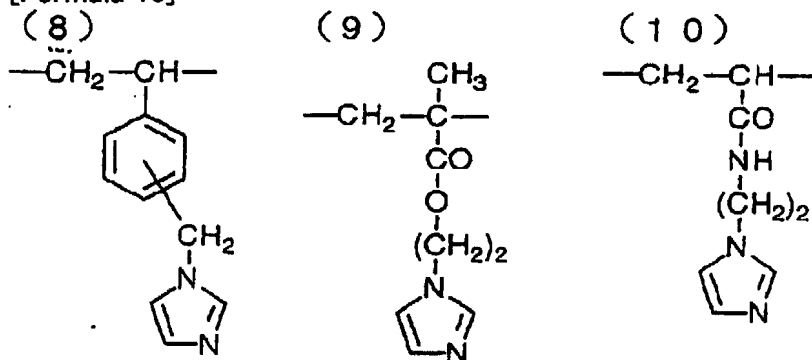
[0042]

[Formula 9]



[0043]

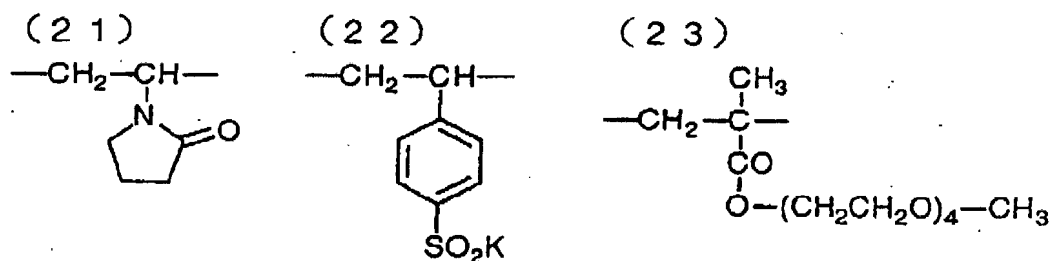
[Formula 10]



[0044] The homopolymer which consists only of a repeat unit which has the third class imidazole group can be used as a polymer mordant. Moreover, \*\*\*\* is also good considering the copolymer which combined two or more kinds of repeat units which have the third class imidazole group as a polymer mordant. Furthermore, the copolymer which combined the repeat unit which has the third class imidazole group, and other repeat units can also be used as a polymer mordant. As for the rate of a repeat unit of having the third class imidazole group in a copolymer, it is desirable that it is more than 50 mol %, and it is still more desirable that it is more than 60 mol %. The example of other repeat units is shown below.

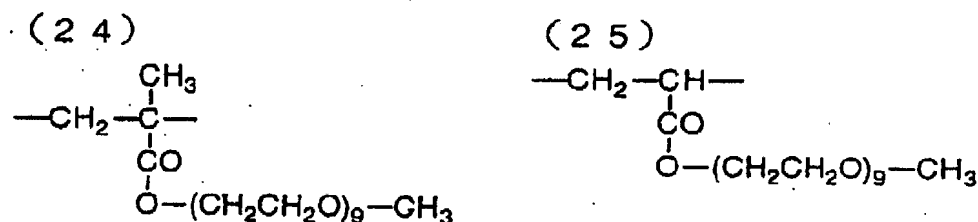
[0045]

[Formula 11]



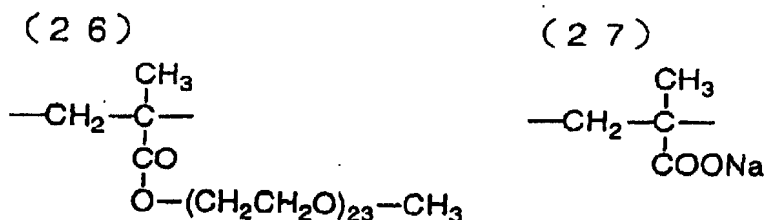
[0046]

[Formula 12]



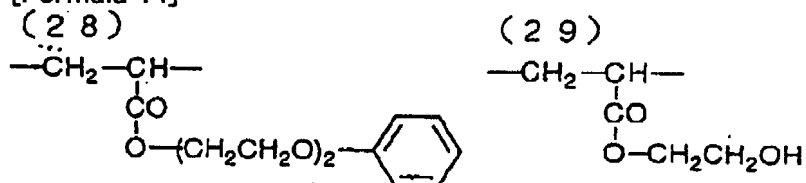
[0047]

[Formula 13]



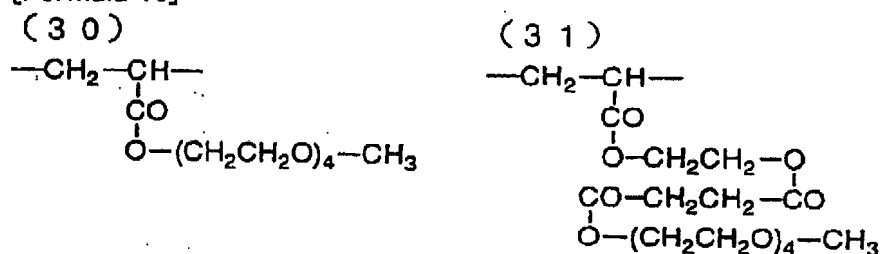
[0048]

[Formula 14]



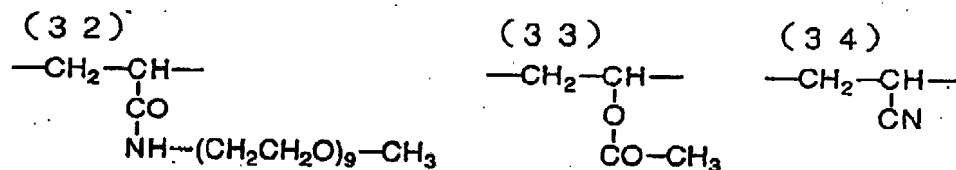
[0049]

[Formula 15]



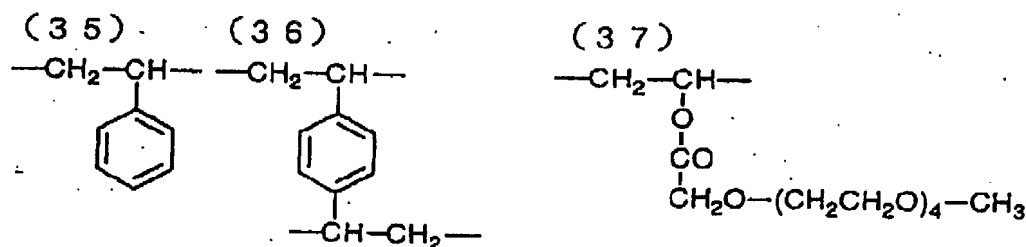
[0050]

[Formula 16]



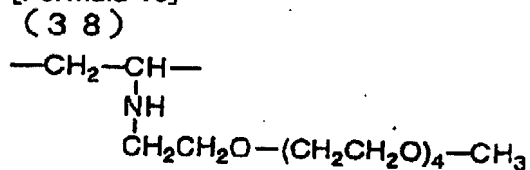
[0051]

[Formula 17]



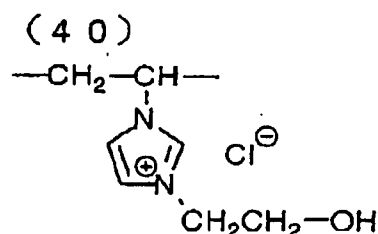
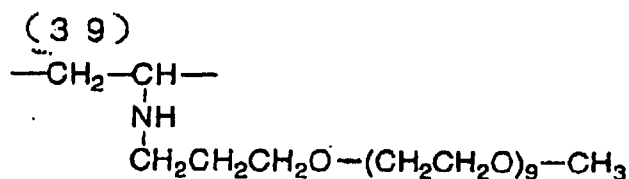
[0052]

[Formula 18]



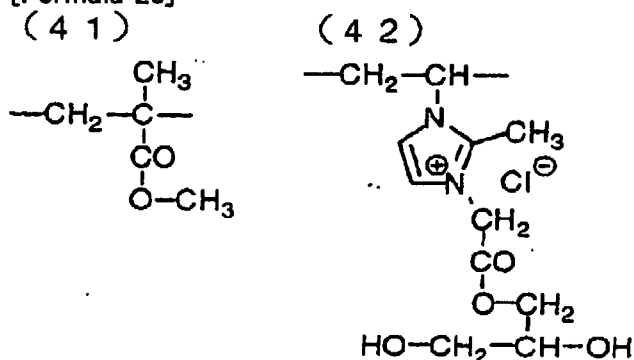
[0053]

[Formula 19]



[0054]

[Formula 20]



[0055] The example of the copolymer which combined the repeat unit which has the third class imidazole group, and other repeat units is shown below. In addition, the figure in a parenthesis means the number of the aforementioned repeat unit in the following examples. Moreover, the figure on the right-hand side of a parenthesis is mol% of a repeat unit.

[0056]

----- copolymer The third class imidazole unit others -- unit  
(the 1) others -- unit (the 2)

----- CPM-1 -(1)50- -(21)50-CPM-2 -(1)90- -(22)10-CPM-3 -  
(1)95- -(22)5 -CPM-4 -(1)90- -(21)5 - -(22)5 -CPM-5 -(1)95- -(23)5 -CPM-6 -(1)95- -(24)5 -  
CPM-7 -(1)95- - (25) 5-CPM-8 - (2)95- -(26) 5-CPM-9-(7)95- - (23) 5-CPM-10 -(10) 90 - (25) 5-  
- (27) 5-CPM-11-(8)90- - (28) 5- - (29) 5-CPM-12 -(1)90- -(30) 5- - (22) 5-CPM-13-(1)90- - (24)  
5- - (22) 5-CPM-14 -(1)95- - (31) 5-CPM-15 -(1)90- -(32) 5- - (22) 5-CPM-16-(10) 90- -(26) 5- -  
(22) 5-CPM-17 -(1)62.5- -(21) 31.25- (22) 6.25 ----- [0057]

----- copolymer The third class imidazole unit others -- unit  
(the 1) others -- unit (the 2)

----- CPM-18 -(1)50- -(33)50-CPM-19 -(1)75- -(22)25-CPM-  
20 -(1)60- -(21)30- -(22)10-CPM-21 -(1)60- -(34)40-CPM-22 -(8)80- -(35)15- -(36)5 -CPM-23 -  
(1)70- -(23)30-CPM-24 -(1)70- - (24) 20- -(22) 10-CPM-25 -(1)80- - (24) 20-CPM-26 -(1)65- -  
(37) 35-CPM-27 -(1)70- - (38) 30-CPM-28 -(1)65- - (39) 25- - (22) 10-CPM-29 -(1)90- - (40) 10-  
CPM-30 -(2)25- -(41) 50- -(42) 25-CPM-31 -(1)35- -(34) 50- -(43) 15 -----

[0058] Two or more kinds of polymer mordants may be used together. As for the molecular weight of a polymer mordant, it is desirable that it is 1000-1 million, and it is still more desirable that it is 10000-200000. the amount of the polymer mordant used -- 0.2-30g/m<sup>2</sup> it is -- things -- desirable -- 0.5 - 15 g/m<sup>2</sup> it is -- things are still more desirable.

[0059] The solid particulate whose [solid particulate whose mean particle diameter is 3-100 micrometers] mean particle diameter is 3-100 micrometers is added by the surface protective layer as a mat agent. In addition, the thickness of a surface protective layer is 0.2-2 micrometers, and is thinner than the mean particle diameter of a solid particulate. Therefore, the solid particulate may exist ranging over the layer under it from the surface protective layer (from the 1st ink fixed bed to the layer above a polyolefine layer). In other words, the solid particulate may exist so that the interface of a surface protective layer and the 1st ink fixed bed may be crossed. Since the spreading layer prepared above a polyolefine layer is generally formed by coincidence spreading, a solid

particulate can be made to exist in a surface protective layer by adding a solid particulate to the coating liquid of one in which it is prepared above a polyolefine layer of layers. However, especially the thing for which a solid particulate is added to the coating liquid of a surface protective layer is desirable. As for the mean particle diameter of a solid particulate, it is desirable that it is 10-100 micrometers, and it is still more desirable that it is 10-30 micrometers.

[0060] The solid particulate used as a mat agent can be classified into an inorganic particle and an organic particle. Oxide (an example, a silicon dioxide, titanium oxide, magnesium oxide, aluminum oxide), an alkaline earth metal salt (an example, a barium sulfate, a calcium carbonate, magnesium sulfate), a silver halide (an example, a silver chloride, silver bromide), and glass are contained in the ingredient of an inorganic mat agent. an inorganic mat agent -- West German JP,2529321,B and British JP,760775,B -- said -- No. 1260772 and a U.S. Pat. No. 1201905 number -- said -- No. 2192241 -- said -- No. 3053662 -- said -- No. 3062649 -- said -- No. 3257206 -- said -- No. 3322555 -- said -- No. 3353958 -- said -- No. 3370951 -- said -- No. 3411907 -- said -- No. 3437484 -- said -- No. 3523022 -- said -- No. 3615554 -- said -- No. 3635714 -- said -- No. 3769020 -- said -- No. 4021245 -- said -- each specification of No. 4029504 has a publication.

[0061] Starch, cellulose ester (an example, cellulose acetate propionate), cellulose ether (an example, ethyl cellulose), and synthetic resin are contained in the ingredient of an organic mat agent. As for synthetic resin, it is desirable that they are water-insoluble nature or water poor solubility. the example of the synthetic resin of water-insoluble nature or water poor solubility -- Pori (meta) acrylic ester (an example --) Poly alkyl (meta) acrylate, poly alkoxy alkyl (meta) acrylate, Poly glycidyl (meta) acrylate, the Pori (meta) acrylamide, Polyvinyl ester (an example, polyvinyl acetate), a polyacrylonitrile, Polyolefine (an example, polyethylene), polystyrene, benzoguanamine resin, a formaldehyde condensation polymer, an epoxy resin, a polyamide, a polycarbonate, phenol resin, a polyvinyl carbazole, and a polyvinylidene chloride are contained. The copolymer which combined the repeat unit of the above polymer may be used.

[0062] In the case of the copolymer, the repeat unit of a little hydrophilic property may be included. An acrylic acid, a methacrylic acid, alpha, beta-partial saturation dicarboxylic acid, hydroxyalkyl (meta) acrylate, sulfoalkyl (meta) acrylate, and a styrene sulfonic acid are contained in the example of the monomer which forms the repeat unit of a hydrophilic property. an organic mat agent -- British JP,1055713,B and a U.S. Pat. No. 1939213 number -- said -- No. 2221873 -- said -- No. 2268662 -- said -- No. 2322037 -- said -- No. 2376005 -- said -- No. 2391181 -- said -- No. 2701245 -- said -- No. 2992101 -- said -- No. 3079257 -- said -- No. 3262782 -- said -- No. 3443946 -- said -- No. 3516832 -- said -- No. 3539344 -- said -- No. 3591379 -- said -- No. 3754924 -- said -- each official report of each specification of No. 3767448, JP,49-106821,A, and 57-14835 has a publication. Two or more kinds of solid particulates may be used together. As for the amount of the solid particulate used, it is desirable that it is 0.01 - 0.5 g/m<sup>2</sup>, and it is still more desirable that it is 0.02 - 0.3 g/m<sup>2</sup>.

[0063] A mean diameter can add a less than 3-micrometer solid particulate for the purpose of adjustment of the rate of absorption of ink, prevention of adhesion, strong amelioration, or amelioration of curl balance of [mean diameter in less than 3-micrometer a solid particulate] gelatin layer and a polyvinyl alcohol layer. As a less than 3-micrometer solid particulate, an inorganic pigment is preferably used for mean particle diameter. A silica pigment, an alumina pigment, a titanium-dioxide pigment, a zinc oxide pigment, a zirconium dioxide pigment, micaceous iron oxide, the white lead, a lead-oxide pigment, a cobalt oxide pigment, strontium chromate, a molybdenum system pigment, a smectite, a magnesium-oxide pigment, a calcium-oxide pigment, a calcium-carbonate pigment, and a mullite are contained in the example of an inorganic pigment. A silica pigment and an alumina pigment are desirable. Two or more kinds of solid particulates may be used together. A spherical silica and an amorphism silica are contained in a silica pigment. A silica pigment is compoundable by dry process, the wet method, or the aerogel method. Surface treatment of the front face of a hydrophobic silica particle may be carried out with a trimethylsilyl radical or silicone. Especially a colloid silica is desirable. As for the mean particle diameter of a silica pigment, it is desirable that it is 4-120nm, and it is still more desirable that it is 4-90nm. As for a silica pigment, it is desirable that it is porosity. As for the average aperture of a porosity silica pigment, it is desirable that it is 50-500nm. Moreover, as for

the average hole volume per weight of a porosity silica pigment, it is desirable that it is 0.5 - 3 ml/g. [0064] An anhydrous alumina and hydrated alumina are contained in an alumina pigment. As a crystal mold of an anhydrous alumina, alpha, beta, gamma, delta, zeta, eta, theta, kappa, rho, or chi can be used. Hydrated alumina is more desirable than an anhydrous alumina. Things can be carried out using monohydrate or three hydrates as hydrated alumina. Pseudo-boehmite, boehmite, and a diasporite are contained in monohydrate. three hydrates -- a gibbsite -- a site and bayerite are contained. As for the mean particle diameter of an alumina pigment, it is desirable that it is 4-300nm, and it is still more desirable that it is 4-200nm. As for an alumina pigment, it is desirable that it is porosity. As for the average aperture of a porosity alumina pigment, it is desirable that it is 50-500nm. As for the average hole volume per weight of a porosity alumina pigment, it is desirable that it is 0.3 - 3 ml/g. Hydrated alumina is compoundable by the approach of hydrolyzing the sol gel process or ulmin acid alkali which ammonia is added [ alkali ] and settles it in aluminum salting in liquid. An anhydrous alumina can be obtained by dehydrating hydrated alumina with heating. It is a dry weight ratio to the binder (gelatin or PVA system polymer) of the layer to add, as for the amount of the inorganic pigment used, it is desirable that it is 5 - 100 % of the weight, and it is still more desirable that it is 20 - 70 % of the weight.

[0065] A surface active agent may be added in a [surface-active-agent] gelatin layer or a polyvinyl alcohol layer. A surface active agent functions as a spreading assistant, an antistatic agent, a slide nature amelioration agent, an emulsification dispersant, or an adhesion inhibitor. A nonionic surface active agent, an anionic surface active agent, a cationic surface active agent, or an amphoteric surface active agent can be used. the example of a nonionic surface active agent -- a steroid (an example, saponin) and an alkylene oxide derivative (an example --) A polyethylene glycol, a polyethylene glycol / polypropylene-glycol condensate, A polyethylene glycol alkyl ether, the polyethylene-glycol alkyl aryl ether, Polyethylene glycol ester, polyethylene-glycol sorbitan ester, Polyalkylene glycol alkylamine and polyalkylene glycol alkylamide The polyethylene oxide addition product, the glycidol derivative (the example, the alkenyl succinic-acid poly glyceride, alkylphenol poly glyceride), and alkyl ester (the example, fatty acid ester of polyhydric alcohol) of silicone are contained.

[0066] Alkyl carboxylate, an alkyl-sulfonic-acid salt, alkylbenzene sulfonate, alkyl naphthalene sulfonate, alkyl-sulfuric-acid ester, alkyl phosphoric ester, an N-acyl-N-alkyl taurine acid, sulfo succinate, sulfoalkyl polyoxyethylene alkylphenyl ether, and polyoxyethylene alkyl eicosanoic acid ester are contained in the example of an anionic surface active agent. An alkylamine salt, aliphatic series or aromatic series quaternary ammonium salt, heterocycle quaternary ammonium salt, phosphonium salt, and sulfonium salt are contained in the example of a cationic surface active agent. Amino acid, an amino alkyl sulfonic acid, amino alkyl sulfuric acid, an amino alkyl phosphoric acid, an alkyl betaine, and an amine oxide are contained in the example of an amphoteric surface active agent. As for the amount of the surfactant used, it is desirable that it is 0.005 - 0.5 g/m<sup>2</sup>, and it is still more desirable that it is 0.01 - 0.1 g/m<sup>2</sup>.

[0067] A slide agent may be added to a [slide agent] image recording medium. High-class sodium alkylsulfate and higher-fatty-acid higher-alcohol ester, Carbowax, high-class alkyl phosphoric ester, and a silicone compound are contained in the example of a slide agent. About the slide agent which can be used, a U.S. Pat. No. 2882157 number, Said 3121060 numbers, said 3850640 numbers, France JP,2180465,B, British JP,955061,B, said 1143118 numbers, said 1263722 numbers, said -- No. 1270578 -- said -- No. 1320564 -- said -- No. 1320757 -- said -- No. 2588765 said -- No. 2739891 -- said -- No. 3018178 -- said -- No. 3042522 -- said -- No. 3080317 said -- No. 3082087 -- said -- No. 3121060 -- said -- No. 3222178 -- said -- No. 3295979 said -- No. 3489567 -- said -- No. 3516832 -- said -- No. 3658573 -- said -- No. 3679411 It is indicated by each official report of each specification of said 3870521 numbers, JP,49-5017,A, 51-141623, 54-159221, and 56-81841, and the research disclosure (Research Disclosure) No. 13969. As for the amount of the slide agent used, it is desirable that it is 5 - 200 mg/m<sup>2</sup>.

[0068] In the spreading layer, especially gelatin layer of a [antiseptics] image recording medium, it is desirable to add antiseptics (an antimicrobial agent or \*\* motorcycle agent). As for antiseptics, it is desirable that it is water solubility. For the example of water-soluble antiseptics, a thiazolyl

benzimidazole compound, an iso thiazolone compound, A chlorophenol compound, a BUROMO phenolic compound, a thiocyanic acid compound, An isothiocyanic acid compound, an acid azide compound, a diamond gin compound, a triazine compound, A thiourea compound, an alkyl guanidine compound, quarternary ammonium salt, An organotin compound, an organic zinc compound, a cyclohexyl phenolic compound, An imidazole compound, a benzimidazole system compound, a sulfamide compound, an activity halogenated compound (an example, chlorination isocyanuric acid sodium), a chelating agent, a sulfurous-acid compound, and an antibiotic (an example, penicillin) are contained. Antiseptics are indicated by each official report and the Horiguchi \*\*\*\*\* "chemistry of antimicrobial mildewproofing" (Showa 57 Sankyo Publishing) of the L.E. waist (L. E. West), water quality criteria ("Water Quality Criteria") Phot.Sci.and Eng., Vol9, No.6 (1965), JP,55-111942,A, 57-8542, 57-157244, 58-105145, and 59-126533.

[0069] A high-boiling point organic solvent may be added in the spreading layer of a [high-boiling point organic solvent] image recording medium. A high-boiling point organic solvent functions as a plasticizer, a slide agent, or a curl inhibitor. The high-boiling point organic solvent which can be used is indicated by JP,62-245253,A. As a high-boiling point organic solvent, silicone oil (an example, dimethyl silicone oil, denaturation silicone oil that introduced various kinds of organic radicals into dimethylsiloxane) may be used. About silicone oil, each official report of JP,62-215953,A and 63-46449 has a publication.

[0070] Polymeric latex may be added in the spreading layer (layer containing a back layer) of a [polymeric latex] image recording medium. Addition of polymeric latex acquires the effectiveness of dimension stabilization, curl prevention, adhesion prevention, or crack prevention. The polymer with a low (less than 40 degrees C) glass transition temperature is excellent in the operation of curl prevention or crack prevention. Moreover, even if it adds a polymer with a high glass transition temperature in a back layer, the curl prevention effectiveness is acquired. About polymeric latex, each official report of JP,62-245258,A, 62-1100668, and 62-131664 has a publication.

[0071] A tenebrescence inhibitor may be added to a [tenebrescence inhibitor] image recording medium. As a tenebrescence inhibitor, an antioxidant, an ultraviolet ray absorbent, or a metal complex can be used. A chroman compound, a coumarane compound, a phenolic compound (an example, hindered phenol), a hydroquinone derivative, a hindered amine derivative, and a SUPIRO in out compound are contained in the example of an antioxidant. The antioxidant is indicated by JP,61-159644,A. A benzotriazol compound (U.S. Pat. No. 3533794 number specification publication), 4-thiazolidone compound (U.S. Pat. No. 3352681 number specification publication), a benzophenone compound (JP,46-2784,A publication), and an ultraviolet absorption polymer (JP,62-260152,A publication) are contained in the example of an ultraviolet ray absorbent. The metal complex is indicated by each official report of each specification of a U.S. Pat. No. 4241155 number, said 4245018 numbers, and said 4254195 numbers, JP,61-88256,A, 62-174741, 63-199248, JP,1-75568,A, and 1-74272.

[0072] A fluorescent brightener may be added to a [fluorescent brightener] image recording medium. A stilbene compound, a coumarin compound, a biphenyl compound, a benzoxazolyl compound, the North America Free Trade Agreement RUIMIDO compound, a pyrazoline compound, and a KARUBO styryl compound are contained in the example of a fluorescent brightener. a fluorescent brightener -- the volume on K.Veenkataraman "The Chemistry of Synthetic Dyes" -- it is indicated by the 5th volume, Chapter 8, and JP,61-143752,A.

[0073] The [image recording approach] image recording medium makes water color ink adhere in a surface protective layer side to the image, and can record an image by water color ink's permeating into a surface protective layer and a polyvinyl alcohol layer, and fixing it in a polyvinyl alcohol layer by this. Specifically, it uses for the image recording approach which consists of the emission and acceptance of coloring matter like an ink jet method, a sublimation mold hot printing method, and a coloring matter diffusion transfer method. If the image recording medium of this invention is used, effectiveness is remarkable in an ink jet method. There are continuous system and a type on demand in an ink jet method. The head of an ink jet is classified into the method which uses a piezo method, Bubble Jet, a thermal jet method, and a supersonic wave. By the image recording approach of the latest ink jet method, the method which injects much ink with thin concentration called photograph ink

by the small volume, the method which improves image quality using two or more ink in which concentration differs by the same hue substantially, and the method using transparent and colorless ink are proposed. an ink jet printer with a print rate quick [ this invention ] -- using -- the image recording approach -- it is and the remarkable image quality amelioration effectiveness is acquired. Moreover, the remarkable image quality amelioration effectiveness is acquired also in the image recording approach using the ink jet printer (injection quantity of ink: two or more 10 ml/m) with which, as for this invention, concentration injects low ink so much.

[0074] in order that [ moreover, ] the latest color ink jet printer may improve image quality -- the yellow from three colors of yellow, a Magenta, and cyanogen, a Magenta, cyanogen, and black -- the class of ink is made to increase by gradually further by four colors with six colors of yellow, a deep Magenta, a thin Magenta, deep cyanogen, thin cyanogen, and black The remarkable image quality amelioration effectiveness is acquired also in the approach this invention records a color picture using many kinds (especially six or more colors) of ink.

[0075]

[Example] Although this invention is explained with an example below, this invention is not limited to this example.

[Example 1]

(Base material) pulp -- the mixing ratio used the paper of fine quality (consistency : 1.053 thickness:152micrometer) of LBKP/NBSP=6/4 as a base material.

[0076] (Formation of a polyolefine layer) Polyethylene was laminated to both sides of a base material at 300 degrees C with the extrusion coating method, the polyolefine layer was formed in them, and the following base material (1) was obtained.

-----	Base material (1) Thickness (micrometer)	-----
-----	surface under coat 0.1 Gelatin	-----
-----	surface polyolefine layer 36.0 Low density polyethylene (consistency 0.923) : The 90.2 sections Titanium oxide which carried out scaling : The 9.8 sections Ultramarine blue : The 0.001 sections	-----
-----	pulp layer 152.0 Paper of fine quality ( )	-----
[ LBKP/NBSP=6/4, ] [ consistency 1.053]	-----	The polyolefine layer on the rear face of 27.0 high density polyethylene (consistency 0.955)
-----	rear-face under coat 0.1 Styrene / acrylate copolymer colloidal silica polystyrene sulfonate soda	-----
-----	The total 215.2	-----

[0077] (Formation of the ink fixed bed and a surface protective layer) On the above-mentioned base material (1), coincidence spreading of each class which consists of the following presentation was carried out, and the television paper 101 was created. In addition, the ink fixed bed (2) is prepared on the surface under coat of a base material (1).

[0078]

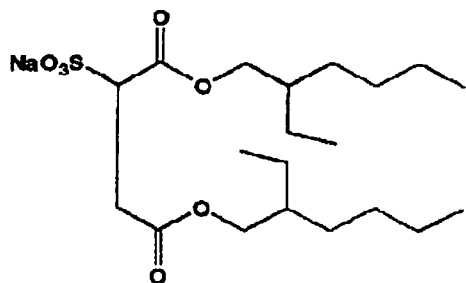
-----	The ink fixed bed (1) coverage	-----
-----	Polyvinyl alcohol (saponification degree: 82%, average-degree-of-polymerization:500) 0.650g/m2 Polymer mordant CPM-17 0.240 g/m2 The following compound W-01 (surfactant) 0.050 g/m2 The following compound F -02 (antiseptics) 0.001 g/m2	-----

-- however, the coating liquid viscosity 15 -- CPS and pH7.5 [0079]

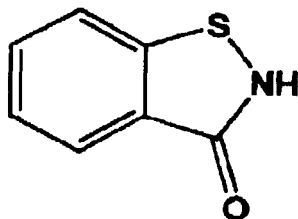
[Formula 21]



W-01



F-02



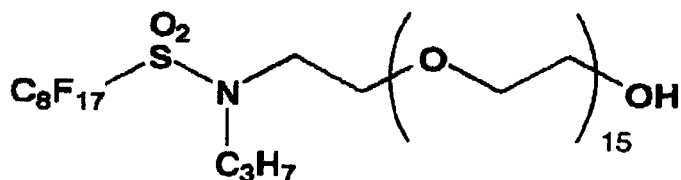
[0080]

----- The ink fixed bed (2) coverage -----  
 ----- Polyvinyl alcohol (saponification degree: 82%, average-degree-of-polymerization:500)  
 0.650g/m<sup>2</sup> Polymer mordant CPM-17 0.240 g/m<sup>2</sup> The above-mentioned compound W-01 (surfactant)  
 0.050 g/m<sup>2</sup> The above-mentioned compound F-02 (antiseptics) 0.001 g/m<sup>2</sup> -----  
 ----- however, the coating liquid viscosity 100 -- CPS and pH8.0 [0081]

----- surface protective layer Coverage -----  
 ----- alkali treatment gelatin 0.130 g/m<sup>2</sup> Mat agent (a PMMA particle, mean particle  
 diameter: 12 micrometers) 0.250 g/m<sup>2</sup> The above-mentioned compound W-01 (surfactant) 0.025 g/m<sup>2</sup>  
 The following compound W-03 (surfactant) 0.015 g/m<sup>2</sup> The above-mentioned compound F-02  
 (antiseptics) 0.002 g/m<sup>2</sup> ----- however, the coating liquid  
 viscosity 30 -- CPS and pH7.5 [0082]

[Formula 22]

W-03



[0083] The television paper 102 as well as the television paper 101 was created except having transposed the poly vinyl alcohol of the television paper 101 to the thing of 92% of saponification degrees, and average degree of polymerization 500. Next, as shown in Table 1, denaturation PVA(1) or (2) (presentation, and the saponification degree added the publication to Table 1, the degree of polymerization added about 500), and the television papers 103-124 as well as the television paper 101 were created except having decreased the quantity of an addition and the polyvinyl alcohol for same weight (saponification degree: 82%, average-degree-of-polymerization:500). It was left under the environment of 50% of 25 degree-C-relative humidity for one week after creating the television papers 101-124.

[0084]

[Table 1]

【表 1】

受像紙	変性PVA(1)又は(2)		添加量 (mg/m <sup>2</sup> )		面質				膜質
	1 (%)	n/mm	インク 固定層 (2)	インク 固定層 (1)	解像度	粒状性	色相	写真近似性	
101 (比較例)	—	—	—	—	○	○	△	○	×
102 (比較例)	—	—	—	—	△	×	×	×	×
103 (本発明)	14	0.88	12	108	○	△	△	△	○
104 (本発明)	14	0.84	14	126	○	○	○	○	○
105 (本発明)	7	0.81	240	2160	○	×	○	△	△
106 (本発明)	7	0.81	160	1440	○	○	○	○	○
107 (本発明)	7	0.81	14	126	○	○	○	○	○
108 (本発明)	7	0.81	1.2	10.8	○	○	○	○	△
109 (本発明)	7	0.81	0.8	7.2	○	○	○	○	×
110 (本発明)	14	0.84	120	0	○	○	○	○	○
111 (比較例)	7	0.81	2400	0	○	△	×	△	△
112 (本発明)	7	0.81	1600	0	○	○	○	○	○
113 (本発明)	7	0.81	140	0	○	○	○	○	○
114 (本発明)	7	0.81	12	0	○	○	○	○	○
115 (本発明)	7	0.81	6	0	○	○	○	○	×
116 (本発明)	6	0.92	120	0	○	○	○	○	○
117 (本発明)	6	0.57	14	126	△	○	○	○	○
118 (本発明)	20	0.81	14	126	○	×	○	△	△
119 (本発明)	0.08	0.81	14	126	○	○	△	○	×
120 (本発明)	3'-47743-2200	—	120	0	○	○	○	○	○
121 (本発明)	7	0.82	650	5850	○	△	△	△	○
122 (本発明)	7	0.81	650	5850	○	○	○	○	○
123 (本発明)	0.5	0.67	14	126	○	○	○	○	△
124 (本発明)	0.5	0.67	140	0	○	○	○	○	△

[0085] Each television \*\*\*\* was judged in 29.5cm long and 21.0cm wide A4 sheet size. The photograph was printed on each sample using the ink-jet color printer (PM750C, the Seiko Epson make, black ink MJIC7, and color ink PMIC1C use). A photograph is a camera (EOS-10, product made from Canon), and read and digital-signal-ized with the scanner the photograph taken to the color reversal film (pro beer 100, Fuji Photo Film Co., Ltd. make). Moreover, the image photoed in part in the digital still camera (FinePix700, Fuji Photo Film Co., Ltd. make) was also used. 20 kinds, such as scenery chosen

based on photographic subject distribution of a general photograph user, nature, a person, clothing, and a still life, were used for the pattern.

[0086] the resolution, the granular nonuniformity (the ink droplet -- being mixed -- the nonuniformity of the shape of a rosary to produce), the hue (similarity with original), and the feeling of photograph approximation of the printed sample were evaluated in four steps, x (it is inferior), \*\* (usually), O (it excels), and O (it excels very much). Evaluation was performed by ten persons and it asked for the average. In addition, five persons who evaluated are those who make evaluation of a photograph a speciality at the Fuji Photo Film Co., Ltd. Ashigara lab, and are those who were engaged in commercialization research of color photography sensitive material at the Ashigara lab where the remainder of five persons is the same, and excelled in photograph evaluation comparatively. A result is shown in the 1st table.

[0087] Next, the image of whole surface blue was printed, it ground against the stylus which pressed down the front face by the fixed load, and membraneous quality was evaluated. Like image quality, the blemish was attached visually and evaluation evaluated the low price in four steps. A result is shown in the 1st table.

[0088] Image quality and the membraneous quality of the television paper of the configuration (103-104,106-108,110,112-114,116-117,120-124) of this invention are good so that more clearly than Table 1.

[0089] The membraneous quality of each example (101,102) of a comparison which does not use the denaturation PVA of this invention is a problem. Even if it uses the denaturation PVA containing the aceto acetyl group, as for some (example 118 of a comparison) to which the rate of the aceto acetyl group exceeds 20% with this invention out of range, some (example 119 of a comparison) which are below 0.1% have a problem in membraneous quality like the example (101,102) of the comparison for which graininess is a problem and does not use the denaturation PVA of this invention. Moreover, the example 105 of the comparison whose addition exceeds 2g, and 111 are inferior in image quality compared with the case (106-108, 112-114) of less than 2g. Compared with the case (106-108, 112-114) of 10mg or more, as for the less than 10mg example 109 of a comparison, or 115, membraneous quality is inferior in an addition.

[0090] Less than 85% of 104 (84% of saponification degrees) and a saponification degree Furthermore, the comparison with 103 (88% of saponification degrees) of 85% \*\*, [ a saponification degree ] Less than 85% of 113 (81% of saponification degrees) and a saponification degree The comparison with 116 (92% of saponification degrees) of 85% \*\*, [ a saponification degree ] The direction of the saponification degree of less than 85% of 104, 113, and 122 is [ the saponification degree ] excellent in less than 85% of 122 (81% of saponification degrees) and a saponification degree 85% in respect of [ comparison / with 121 (92% of saponification degrees) of \*\* ] image quality. Moreover, if 60% or more of 107 (81% of saponification degrees) and a saponification degree compare [ a saponification degree ] less than 60% of 117 (57% of saponification degrees), the saponification degree is excellent in the direction of 60% or more of 107 in respect of image quality.

[0091] Moreover, the comparison with 116 which concentrated on 103 and the lower layer which were used for homogeneity, and used Denaturation PVA for all layers, The direction of 116 which concentrated on the lower layer and was similarly used for all layers from the comparison with 110 concentrated and used for 104 and the lower layer which were used for homogeneity, and the comparison with 112-114 concentrated and used for 106-108 and the lower layer which were used for homogeneity at all layers, 110, and 112-114 is excellent in image quality and membraneous quality.

[0092] Although the television papers 201-224 were produced similarly except having transposed to 88% of saponification degrees of non-denaturalized PVA used together, and polymerization-degree about 500 thing and being evaluated similarly, image quality membraneous quality was inferior to 101-124.

[0093] Moreover, although not indicated in Table 1, the result in which the television paper of the configuration of this invention is excellent image shelf life (the resistance especially over heat) was obtained. Moreover, except having used the base material as the white PET base material, as a result of producing the television papers 301-324 and testing similarly like the television papers 101-124, the same inclination as the result shown in Table 1 was seen.

[0094]

[Effect of the Invention] The image recording medium of this invention blends with the ink fixed bed the denaturation PVA which has the structural unit which has the aceto acetyl group, further, according to the saponification degree of Denaturation PVA, blends Native PVA and is constituted. Consequently, the image recording medium of this invention is preferably used for the printer of the ink jet method with which recently was improved, and the outstanding image quality (resolution, graininess, hue) and strong membraneous quality are obtained.

---

[Translation done.]